***As enclosed to IPER***

**We claim:**

1. A continuous process for fractionating a $C_4$ fraction ($C_4$) by extractive distillation using a selective solvent (LM) in an extractive distillation column (EDK), wherein a dividing wall (TW) is installed in the longitudinal direction in the extractive distillation column (EDK) to form a first region (A), a second region (B) and a lower combined column region (C) and a top stream ($C_4H_{10}$) comprising the butanes is taken off from the first region (A), a top stream ($C_4H_8$) comprising the butenes is taken off from the second region (B) and a stream ($C_4H_6$) comprising the hydrocarbons from the $C_4$ fraction which are more soluble in the selective solvent (LM) than are the butanes and the butenes is taken off from the lower combined column region (C).

2. A process as claimed in claim 1, wherein the stream ($C_4H_6$) comprising the hydrocarbons from the $C_4$ fraction ($C_4$) which are more soluble in the selective solvent (LM) than are the butanes and the butenes is taken off as a side stream from the lower combined column region (C) and the selective solvent (LM) is taken off as bottom stream from the extractive distillation column (EDK).

3. A process as claimed in claim 1, wherein the stream ($C_4H_6$) comprising the hydrocarbons from the $C_4$ fraction ($C_4$) which are more soluble in the selective solvent (LM) than are the butanes and the butenes is taken off together with the selective solvent (LM) as bottom stream from the extractive distillation column (EDK).

4. A process as claimed in any of claims 1 to 3, wherein the $C_4$ fraction ($C_4$) is fed into the first region (A) of the extractive distillation column (EDK), the top stream ($C_4H_{10}$) comprising the butanes is taken off from the region (A) of the extractive distillation column (EDK) and the top stream ($C_4H_8$) comprising the butenes is taken off from the region (B) of the extractive distillation column (EDK).

5. A process as claimed in any of claims 1 to 3, wherein two or more, preferably two or three, thermally coupled columns are used in place of the extractive distillation column (EDK) with dividing wall (TW).

6. A process as claimed in any of claims 1 to 5, wherein the selective solvent used comprises one or more of the substances: dimethylformamide, acetonitrile, furfural, N-methylpyrrolidone (NMP), preferably NMP in aqueous solution.

7. A process as claimed in any of claims 1 to 6, wherein from 10-80, preferably 25, theoretical plates are located in the region of the dividing wall of the extractive distillation column (EDK).

8. A process as claimed in any of claims 1 to 7, wherein a heterogeneously catalyzed selective hydrogenation of the hydrocarbons containing triple bonds from the $C_4$ fraction ($C_4$) to hydrocarbons containing double bonds is additionally carried out in the extractive distillation column (EDK).

9. A process as claimed in any of claims 1 to 7, wherein the stream ($C_4H_6$) comprising the hydrocarbons which are more soluble in the selective solvent (LM) than are the butanes and butenes which is taken off from the extractive distillation column is fed to a first distillation column (K I) in which it is separated into a top stream (K I-K) comprising 1,3-butadiene, propyne, possibly further low boilers and possibly water, and a bottom stream (K I-S) comprising 1,3-butadiene, 1,2-butadiene, acetylenes and possibly further high boilers, with the proportion of 1,3-butadiene in the bottom stream (K I-S) from the distillation column (K I) being regulated so that it is sufficiently high to dilute the acetylenes to outside the range in which there is a risk of spontaneous decomposition and the top stream (K I-K) from the first distillation column (K I) is fed to a second distillation column (K II) and in this is separated into a top stream (K II-K) comprising propyne, possibly further low boilers and possibly water and a bottom stream (K II-S) comprising pure 1,3-butadiene.

10. A process as claimed in claim 1, wherein the bottom stream from the first distillation column and the top stream from the second distillation column are passed to a reactive distillation column in which a heterogeneously catalyzed

selective hydrogenation of the hydrocarbons containing triple bonds to hydrocarbons containing double bonds is carried out by means of hydrogen, with a partial conversion of the acetylenes, to give a top stream comprising 1,3-butadiene, butanes, butenes and non-hydrogenated hydrocarbons having triple bonds and a bottom stream comprising high boilers which is discharged.

11. A process for fractionationating a $C_4$ fraction as claimed in any of claims 1 to 8, characterised in by the further process step, wherein the stream ($C_4H_8$) comprising the butanes isobutene, 1-butenes and 2-butenes is further processed in a reactive distillation column to give a stream comprising predominantly isobutene and a stream comprising predominantly 2-butenes, with 1-butene being hydroisomerized to 2-butenes in the reactive distillation column and the stream comprising predominantly isobutene being taken off as top stream from the reactive distillation column and the stream comprising predominantly 2-butenes being taken off as bottom stream from the reactive distillation column.

12. A process for fractionationg a $C_4$ fraction as claimed in any of claims 1 to 8, characterised in by the further process step wherein the stream ($C_4H_8$) comprising the butanes is subjected to a selective etherification of the isobutene and fractionation to give a stream comprising the isobutene ether and a stream comprising 1-butene and 2-butenes and subsequently further processing the stream comprising 1-butene and the 2-butenes by gas-phase isomerization of the 2-butenes to give a stream comprising predominantly 1-butene or by hydroisomerization of the 1-butene to give a stream comprising predominantly 2-butenes.

13. A process fractionating a $C_4$ fraction as claimed in any of claims 1 to 8, characterized in by the further process step wherein the stream ($C_4H_8$) comprising the butenes isobutene, 1-butene and 2-butenes, is further processed by skeletal isomerization of 1-butene and 2-butenes to isobutene, giving a stream comprising predominantly isobutene.

14. A process for fractionating a $C_4$ fraction as claimed in any of claims 1 to 8 characterized in by the further process step wherein the stream ($C_4H_8$) comprising the butenes isobutene, 1-butene and 2-butenes, is further processed by separating

off isobutene and working it up by skeletal isomerization to give a stream comprising predominantly 1-butene and 2-butenes.

15. A process for fractionating a $C_4$ fraction as claimed in any of claims 1 to 8 characterized in by the further process step wherein the stream ($C_4H_8$) comprising the butenes isobutene, 1-butene and 2-butenes, is further processed by separating off isobutene and processing it further by hydrogenation to give a stream which comprises predominantly isobutane and is preferably fed to a cracker or by skeletal isomerization to give a stream comprising predominantly n-butane and dehydrogenation of the latter to give a stream comprising predominantly 1-butene and 2-butenes.

16. A process for fractionating a $C_4$ fraction as claimed in any of claims 1 to 8 characterized in by the further process step wherein the stream ($C_4H_8$) comprising the butenes isobutene, 1-butene and 2-butenes, is further processed by selective dimerization of isobutene to the corresponding $C_8$-hydrocarbons and subsequent fractional distillation to give a stream comprising 1-butene and 2-butenes and a stream comprising the $C_8$-hydrocarbons.